

710

## CLAIMS

We claim:

1. A method of classifying packet information using content addressable memory (CAM), the method comprising the step of:

5 receiving a set of reconfigurable selection criteria from a user wherein said set of selection criteria is limited by CAM constraint.

2. A method as defined in claim 1 further comprising, in any operative sequence, the steps of:

receiving packet information;

10 determining packet structure of said packet information;

storing said packet information into packet memory;

generating at run time a bit mask based on said determined packet structure and said received set of selection criteria; and

15 generating a search key using said bit mask and said packet information stored in packet memory.

3. A method as defined in claim 2 further comprising, in any operative sequence, the step of:

using said search key to do a search or a lookup in the classification database contained in a CAM to determine the rule or policy of said packet information.

20 4. A method as defined in claim 2 wherein said generation of said search

key is via a sequential serial approach wherein the index locations of all 1's in said bit mask are determined, the corresponding offset values retrieved from said packet memory, and said corresponding retrieved values are packed or collected to generate said search key.

5           5.     A method as defined in claim 2 wherein said generation of said search key is via a fully parallel approach wherein the index locations of all 1's in said bit mask are determined, the corresponding offset values retrieved from said packet memory, and said corresponding retrieved values are packed or collected to generate said search key in one clock cycle.

10           6.     A method as defined in claim 2 wherein said generation of said search key is via a semi-parallel approach wherein said bit mask is processed in multiples of certain bits (submasks) until the complete said bit mask is processed, and the index locations of all 1's in each submask are determined, the corresponding offset values retrieved from said packet memory, and said corresponding retrieved values are  
15 packed or collected to generate said search key.

7.     A content addressable memory (CAM) controlling hardware wherein said CAM controlling hardware

receives a set of reconfigurable selection criteria from a user wherein said selection criteria is limited by CAM constraint.

20           8.     A CAM controlling hardware as defined in claim 7 wherein said CAM

controlling hardware further

receives packet information;

determines packet structure of said packet information;

stores said packet information into packet memory;

5 generates at run time a bit mask based on said determined packet structure and  
said received set of selection criteria; and

generates a search key using said bit mask and said packet information stored  
in packet memory.

9. A CAM controlling hardware as defined in claim 8 wherein said CAM  
10 controlling hardware further

uses said search key to do a search or a lookup in the classification database  
contained in a CAM to determine the rule or policy of said packet information.

10. A CAM controlling hardware as defined in claim 8 wherein said  
generation of said search key is via a sequential serial approach wherein the index  
15 locations of all 1's in said bit mask are determined, the corresponding offset values  
retrieved from said packet memory, and said corresponding retrieved values are  
packed or collected to generate said search key.

11. A CAM controlling hardware as defined in claim 8 wherein said  
generation of said search key is via a fully parallel approach wherein the index  
20 locations of all 1's in said bit mask are determined, the corresponding offset values

retrieved from said packet memory, and said corresponding retrieved values are packed or collected to generate said search key in one clock cycle.

12. A CAM controlling hardware as defined in claim 8 wherein said generation of said search key is via a semi-parallel approach wherein said bit mask is processed in multiples of certain bits (submasks) until the complete said bit mask is processed, and the index locations of all 1's in each submask are determined, the corresponding offset values retrieved from said packet memory, and said corresponding retrieved values are packed or collected to generate said search key.

13. An integrated circuit containing a content addressable memory controlling hardware as defined in claim 7.

14. An integrated circuit containing a content addressable memory controlling hardware as defined in claim 8.

15. An integrated circuit containing a content addressable memory controlling hardware as defined in claim 9.

16. An integrated circuit containing a content addressable memory controlling hardware as defined in claim 10.

17. An integrated circuit containing a content addressable memory controlling hardware as defined in claim 11.

18. An integrated circuit containing a content addressable memory controlling hardware as defined in claim 12.

19. A packet classifier system comprising:

a content addressable memory (CAM) controlling hardware that generates a CAM search key based on a set of reconfigurable selection criteria provided by a user and a bit mask generated at run time based on the packet structure of a packet information received; and

a packet memory.

20. A router or switch comprising

an integrated circuit containing a content addressable memory (CAM) controlling hardware which interfaces with an ingress manager by receiving packet information, which interfaces with a CAM to do a search or lookup on the classification database contained in said CAM, which interfaces with an action content database (RAM/Memory) to do a memory read, and which interfaces with an egress manager which sends out packet information.

21. A method of enabling a user to reconfigure a router or switch, the

method comprising:

providing a user interface wherein said user is able to define a set of reconfigurable selection criteria to determine a CAM search key; and receiving said selection criteria.

22. A method as defined in claim 21 further comprising the step of:

providing information regarding the CAM constraint.

23. A method as defined in claim 22 wherein said CAM constraint is the CAM search key size.

24. A method as defined in claim 21 further comprising, in any operative sequence, the step of

5 providing a selection of predefined classification templates retrieved from data store from which said user may select one or more of said classification templates to define said set of selection criteria.

25. A method as defined in claim 21 further comprising, in any operative sequence, the step of:

10 providing a selection of available fields from various network protocols retrieved from data store from which said user may select one or more of said fields to define said set of selection criteria..

26. A method as defined in claim 25 wherein said selection of available fields changes depending on what set of selection criteria has already been defined by  
15 said user.

27. A computer software product for use in a computer system that executes program steps recorded in a computer-readable media to perform a method for enabling a user to reconfigure a router or switch, the method comprising:

a) a recordable media; and

b) a program of computer-readable instructions executable by the computer to perform method steps comprising:

- i) providing a user interface wherein said user is able to define a set of reconfigurable selection criteria to determine a CAM search key; and
- ii) receiving said selection criteria.

28. A computer software product as defined in claim 27 wherein said program perform method steps further comprising, in any operative sequence, the step of :

providing information regarding the CAM constraint.

29. A computer software products as defined in claim 28 wherein said CAM constraint is the CAM search key size.

30. A computer software products as defined in claim 27 wherein said program perform method steps further comprising, in any operative sequence, the step of:

providing a selection of predefined classification templates retrieved from data store from which said user may select one or more of said classification templates to define said set of selection criteria.

31. A computer software products as defined in claim 27 wherein said program perform method steps further comprising, in any operative sequence, the step

of :

providing a selection of available fields from various network protocols retrieved from data store from which said user may select one or more of said fields to define said set of selection criteria.

5           32. A computer software products as defined in claim 31 wherein said selection of available fields changes depending on what set of selection criteria has already been defined by said user.

33. An apparatus that enables a user to reconfigure a router or switch, the method comprising:

- 10           a) a central processing unit;
- b) a storage device;
- c) a processor connected to the storage device wherein the storage device stores:
- i) at least one program component for controlling the processor; and
- 15           d) the processor is operative with said program component to:
- i) provide a user interface wherein said user is able to define a set of reconfigurable selection criteria to determine a CAM search key; and
- ii) receive said selection criteria.

34. An apparatus as defined in claim 33 wherein said processor is operative

20 with said program component to further:



provide information regarding the CAM constraint.

35. An apparatus as defined in claim 34 wherein said CAM constraint is the CAM search key size.

36. An apparatus as defined in claim 33 wherein said processor is operative  
5 with said program component to further:

provide a selection of predefined classification templates retrieved from data store from which said user may select one or more of said classification templates to define said set of selection criteria.

37. An apparatus as defined in claim 33 wherein said processor is operative  
10 with said program component to further:

provide a selection of available fields from various network protocols retrieved from data store from which said user may select one or more of said fields to define said set of selection criteria.

38. An apparatus as defined in claim 37 wherein said selection of available  
15 fields changes depending on what set of selection criteria has already been defined by said user.